# **Clam Culture for New Growers**

The Basics of Buying, Handling, and Planting Hard Clam Seed

o Certification and Best Management Practices

- Lease markers and boat requirements
  - Hard clam seed suppliers
  - o Basic clam seed descriptors
  - How to transport and handle seed
    - o Water conditions at lease sites
    - o Clam bag sizes and suppliers
- o Stocking rates for nursery and growout seed
  - Planting strategies and growth rates
    - Mortality and predator protection
      - Other considerations

IFAS





#### Aquaculture Certification "AQ" Card

- Obtained from Florida Department of Agriculture and Consumer Services (FDACS), Division of Aquaculture
- Any person engaged in aquaculture required to obtain aquaculture certification ("AQ" card)
- Identifies the culturist, lease, product and facility
- Authorized user agreement for "sharecroppers" or employees
- Renewed annually
- Cost of \$100
- Valid from July 1 to June 30
- Contact DACS for more at (850) 617-7600



#### Aquaculture Certification "AQ" Card

Harvester Education Training Requirements

- As of 2014 the NSSP Model Ordinance was modified to include new food safety training requirements
- Under this mandate, shellfish leaseholders, authorized users, employees or harvesters are required to obtain training on handling practices prior to certification
- No certification or recertification will be issued without proof of training
- Training must be completed every year
- Can be completed online at <u>https://learningMyFWC.remote-learner.</u> <u>net/logon/index.php</u>



#### Best Management Practices

(Excerpted from Florida Aquaculture Policy Act, Chapter 597 F.S.)

- All certified aquaculturists must abide by BMPs
- BMPs are developed for each segment of the aquaculture industry
- BMPs consist of general and specific instructions that address construction, operation and management of an aquaculture facility
- BMPs do not supersede applicable federal or local authorities
- Contact staff at the FDACS Division of Aquaculture office in Tallahassee for more info on BMPs, Phone: (850) 617-7600, or visit their website <a href="https://www.fdacs.gov/Agriculture-Industry/Aquaculture/Aquaculture-Certificate-of-Registration/Aquaculture-Best-Management-Practices">https://www.fdacs.gov/Agriculture-Industry/Aquaculture-Certificate-of-Registration/Aquaculture-Best-Management-Practices</a>

#### Best Management Practices pertaining to Hard Clam Seed Stocks

#### Genetic Protection

- Hatchery operators must use hard clam broodstock from Florida waters in their genetic selection program
- Documentation of broodstock origin must be obtained by seed buyer
- If out-of-state seed is bought, the hatchery must use Florida broodstock
- Seed shipped from hatcheries must be in distinct containers with the producers AQ #



#### Best Management Practices pertaining to Hard Clam Seed Stocks

#### Disease Prevention

- Seed imported from out-of-state for aquacultural purposes must be accompanied by documenttation from a licensed veterinarian certifying that stocks do not show clinical signs which may pose a threat to natural shellfish populations
- For clams, stocks must be free of QPX
- Public Health
  - Seed clams must be relocated to a growout lease prior to reaching 16 mm in shell length



# Aquaculture Lease Markers

(Excerpted from Lease Instrument and Chapter 18-21, F.A.C.)

- SIGNS, 3' by 3', usually on 6" PVC pipes, mark corners and specific perimeter points in aquaculture use zone
  - 2" yellow reflective tape on diamond shape sign
  - 12" black letter on yellow reflective background
- POSTS or STAKES, usually 2" PVC pipe, mark corners of individual parcels
  - Field at least  $2\frac{1}{2}$ " wide x 20" long
  - Band of orange reflective tape above and below field
  - 2" black characters for lease number and corner information (NW, NE, SW, SE)





Post, buoy and corner marker labels in this example are for reference only. Refer to your lease agreement for specific marker locations, types required and parcel/lease identification numbers. Refer to U.S. Coast Guard Private Aids to Navigation for lighting requirements.

Contact the Division of Aquaculture for assistance at (850) 617-7600.

Parcel Post

#### Sign can be installed at any corner of the parcel in conjunction with the lease markers illustrated above

Parcel Buoy



Either buoys or posts must be used consistently on lease site.

Aquaculture Lease Marker Examples

- AUZ lease corners and perimeters
- Lease parcel post or buoy
- Optional

Florida Department of Agriculture and Consumer Services

FDACS-P-00070 Rev. 06/2020

# Other Informational Signs

(Excerpted from Lease Instrument and Chapter 18-21, F.A.C.)

#### ATTENTION BOATERSI SHELLFISH AQUACULTURE LEASE AREAS within Alligator Harbor OBSERVE MARKED AREAS



When dive flag is present, shellfish growers are in water tending crops. Stay clear.



Restricted anchoring. Avoid anchoring in clam beds and any contact with the bottom.



Shellfish harvesting prohibited except by leaseholder.







#### Educational signs



#### Boat Requirements for Clamming (Excerpted from Comprehensive Shellfish Control Code, Chapter 5L-1)

- Constructed, operated and maintained to protect clams from contamination
- Fuel tanks or other contamination sources may not come into contact with clams
- False bottoms and bulkheads fore and aft to prevent clams from coming in contact with bilge water



- No dogs or other animals allowed on boat
- Type III marine sanitation device, portable toilet, or other sewage disposal receptacle that will not spill
- Effective shading to protect clams from exposure to sun, birds, and other adverse conditions

U.S. Coast Guard Requirements for Commercial Fishing Vessels (16-26')

- Boat must be registered commercial and comply with U.S. Coast Guard commercial fishing industry vessels
  - Personal Flotation Devices Type I, II, III, V
    - o One PFD per person on vessel
    - o 62 square inches of reflective tape (31 in<sup>2</sup> front & back)
    - Approved PFD light attached to front shoulder area
    - Vessel name or FL number
  - Throwable Flotation Device
    - 1 cushion or orange 24-inch ring life buoy with 60 feet of line
    - o Vessel name or FL number



U.S. Coast Guard Requirements for Commercial Fishing Vessels (16-**26'**)

- Boat must be registered commercial and comply with U.S. Coast Guard commercial fishing industry vessels
  - Distress Signals
    - One flag or smoke signals for day or 3 approved flares for both day and night
  - Fire Extinguishers
    - o Outboard engine and portable gas tanks: not required
    - o 1 B-1 type
  - Sound producing device
- Marine Safety Office Inspections
  - No charge, receive decal
  - Check with local USCG Marine
     Safety Officer or USCG Auxiliary



### Clam Seed Suppliers

- Check the annual Florida Shellfish Seed Suppliers List posted at the website <u>http://shellfish.ifas.ufl.edu</u>
- ✓ Check the annual East Coast Shellfish Seed Suppliers List posted at <u>http://www.ecsga.org</u>



#### How to describe clam seed?



Sieve size used in size grading (mm)

- Based on bar mesh
- 1 inch = 25 mm



#### How to describe clam seed?



Volumetric (number/ml)
 1000 milliliters (ml) = 1 liter (l)
 1 liter = approx. 1 quart

#### Sub-sampling / Counting



#### How to describe clam seed?



- Shell length (mm), longest distance across shell
- 1 inch = 25 millimeters (mm)





#### Clam Seed Sizes

Bag Mesh Size	Sieve Mesh Size (mm)	Seed Size (length, mm)	Seed Count (number/ml)
Nursery (3 mm)	3.3	5.0	15-20
Nursery (4 mm)	4.0	6.0	9-12
Growout (9 mm)	7.5	12.0	1-2
Growout (12 mm)	12.0	15.0	0.5-0.9

### Clam Seed Transporting Tips

- Transport "out of water" for limited period of 24 to 36 hours
  - Includes time seed is sieved, packed and transported
- Transport cool and moist
  - Temperature around 65-70 °F
  - Seed wrapped in an absorptivetype material that maintains moisture but is porous
- Transport in insulated cooler with gel packs or frozen jugs
  - Do not let seed get in direct contact with gel packs, wrap in newspaper
  - Keep seed off bottom of cooler



Clam Seed Handling Tips



- Check weather conditions before arranging for seed delivery
- ✓ Make sure you can get to lease site ASAP to plant seed
- Make sure bags and supplies are ready for planting
- ✓ Get seed information from supplier (e.g., number per ml)
- Check seed upon arrival to be sure it is alive
- Clams that are gapping and do not shut when tapped will eventually die; seed should not be warm upon arrival
- ✓ There should be no foul smell
- Do not place seed in direct sunlight; provide shading at all times, but do not use a nonporous material
- Salinity values at lease area should be within 5 ppt of the water from which seed was obtained

# Water Conditions at Lease Site and their Role on Clam Production



Publications on the role of temperature, salinity and dissolved oxygen on hard clam production can be found online at <u>http://shellfish.ifas.ufl.edu/publications</u>

- Necessary for clam farmers to assess environmental conditions at lease and apply management strategies
- Important water quality parameters controlling survival and growth of clams
  - Water temperature
  - Salinity
  - Dissolved oxygen
- Clams are grown in inshore coastal waters where water conditions fluctuate and can exceed clam tolerance limits

#### Water Conditions at Lease Site: WATER TEMPERATURE

- Definition
  - Measure of water's warmth or coldness with reference to a standard value
- Units
  - Celsius (C) / Fahrenheit (F)
    - Boiling point: 212 °F
    - Freezing point: Fresh water: 32 °F, Sea water: 28 °F
- Characteristics
  - Essential for water data collection
  - Other measurements/determinations rely on temperature
    - Dissolved oxygen and conductivity
    - Plant photosynthesis
    - Metabolic rates of aquatic organisms



#### Water Conditions at Lease Site: WATER TEMPERATURE

- Influencing Factors
  - Seasonal weather changes
  - Water depth
  - Mixing of water due to tides, wind
- Effects on Clams
  - Clams are cold-blooded animals
  - Metabolic rate influenced by water temperature
  - Growth greatly affected by temperature
    - Optimum: 60-80 °F
    - Growth ceases < 48  $^{\circ}$ F and > 88  $^{\circ}$ F
    - Adverse effects > 90 °F
    - Adult clams survive temperatures below freezing for short durations by burying



#### How to measure TEMPERATURE?



- Continuous information
- Can be programmed to record every 30 minutes for up to six months, or every two hours for 17 months



- HOBO<sup>®</sup> Pendant Temperature
   Data Logger
- Small (2.3 x 1.3 x 0.9 inches)
- Waterproof, can be placed inside a clam bag
- Inexpensive
- <u>htpp://www.onsetcomp.com</u>

#### Water Conditions at Lease Site: SALINITY

- Definition
  - Relative salt content in waters
  - Measured by conductivity
- Units
  - Parts per thousand (ppt or psu)
- Characteristics
  - Fresh water: 0 ppt
  - Sea water: 30-35 ppt
  - Estuaries: waters where fresh and seawater join and mix
    - Salinity can exceed sea water values during long periods of drought
    - Short-term and long-term fluctuations in salinity are natural in estuaries and inshore coastal waters



#### Water Conditions at Lease Site: SALINITY

- Influencing Factors
  - Varies within an estuary due to
    - Distance from freshwater sources, Movement of tides
    - Dilution by rainfall, Mixing of water by wind
  - Determines stratification in an estuary
    - Increases with water depth
    - Tides, wind and storms can eliminate layering
    - Also shape of estuary and volume of freshwater inflow
- Effects on Clams
  - Growth also affected by salinity
    - Optimum range: 20-30 ppt
    - Growth ceases <15-18 ppt

#### Water Conditions at Lease Site: SALINITY

- Effects on Clams (continued)
  - Survival affected by salinity
    - Can survive periodic fluctuations and periods of lower salinities by closing valves, or shells
    - Adults can survive salinity  $\leq$  15 ppt
    - Juveniles are vulnerable especially after planting
    - Seed will die at < 15 ppt for extended periods
    - Other influencing factors
      - Source of freshwater
      - Rate of salinity change
      - Water temperature
        - Growth and survival decreases sharply when salinity is low and temperature is high
    - Begin to die at > 40 ppt



Purchase at aquaculture equipment suppliers Pentair Aquatic Eco-systems 0

specific gravity and converts to salinity (ppt)

# Real-time WATER QUALITY information http://shellfish.ifas.ufl.edu/waterquality/

#### **Dog Island Data Sonde**



### Clam Culture Bag

- Woven polyester mesh sewn in the shape of a bag
- Spout (about 8") on one corner
- Various mesh sizes
- Field nursery
  - o 3 and 4 mm
- Growout
  - o 9 to 12 mm
- Several bag dimensions
  - o Usually 4' by 4'



- Developed for Florida because of subtidal growing conditions
- Serves as predator protection
- Used as harvesting device as it contains the clams

#### Clam Culture Bag

- Planted as single bag
- Staked to bottom using a variety of materials
  - PVC pipe
  - o Pencil rod
  - o Rebar
- Soft material allows bag to fit bottom contour
- Naturally occurring sediments serve as substrate



### Clam Culture Bag

- Planted in belts of 5 to 10 bags
- Belts are made in advance
- Tie-warps (cable ties) are used to connect bags and attach stakes
- Efficient method of stocking and planting multiple bags



#### Clam Bag **Suppliers**

- Requires serged seam to handle clam weight
- Several clam bag manufacturers in Florida
- Fabric and thread suppliers available
- Check the list of suppliers posted at the website http://shellfish.ifas.ufl.edu/ <u>suppliers</u>

#### **2015 Clam Bag Suppliers**

These suppliers are providing clam bags to Florida growers this year. Contact suppliers directly for information on mesh and bag sizes, prices, and availability.

Island Bags 16710 SW 121st Lane P.O. Box 86 Cedar Key, FL 32625 Contact: Carla and Ray Ermel (352) 543-5231 (352) 949-1869 (cell) isbags@att.net

M&R Seafood

Cedar Key, FL 32625

(352) 215-3121 (cell)

lason Mills, LLC

Milltown, NJ 08850

(732) 651-7200

Contact: Mike Lavroff

(732) 651-7222 (fax)

info@iasonmills.com

www.jasonmills.com

440 South Main Street

rickviele@bellsouth.net

Contact: Rick Viele

P.O. Box 840

3521 543-9395

Southern Belle Clam Bags 423 NE 833rd Street Old Town, FL 32680 Contact: Faith van Orden (352) 542-2508 (352) 542-5288 (cell) ospreyf@bellsouth.net

Supertex Liberty Industries

312 W. Luther Avenue

Contact: Sarah, Kat or Ed

(800) 790-1000 (office)

Liberty, NC 27298

12170 State Road 24 Cedar Key, FL 32625 Contact: Brent Sanchez (352) 543-5980 southernerosselams@gmail.com www.clambiz.com

Southern Cross Seafarms

#### **Thread Supplier**

Komar Alliance

370 East Maple Ave., Ste. 202 Langhorne, PA 19047 Contact: David Weitz (800) 220-1529, ext. 8914 (251) 750-3590 (fax) dweitz@komar.com

Provided by: University of Florida Shellfish Aquaculture **Extension Program** P.O. Box 89 Cedar Key, FL 32625 Phone: (352) 543-5057 Email: LNST@ufl.cdu Website: shellfish.ifas.ufl.edu

This list is provided as a service of IFAS, University of Florida. We do not sponsor or endorse any of these suppliers above any others. These lists have been compiled as informational handouts to interested persons.

UNIVERSITY

IFAS Extension

FLORIDA

August 2015

(800) 790-1003 (cell) (336) 622-1002 (fax) info@supertex-inc.com www.supertex-inc.com

**Fabric Suppliers** Supertex Liberty Industries 312 W. Luther Avenue Liberty, NC 27298 Contact: Sarah, Kat or Ed (800) 790-1000 (office) (800) 790-1003 (cell) (336) 622-1002 (fax) info@supertex-inc.com www.supertex-inc.com

#### Summit Textiles 540 Gadsden Court Spartanburg, SC 29302 Contact: Tom Howell (864) 582-0400 (864) 573-8603 (fax) thcortina@aol.com

### Clam Bag Tags

- Various tags are used by growers to provide identification as well as information, such as planting date, stocking rate, or seed source
- Some crop assistance programs may require growers to place tags in bags with their name and aquaculture certificate number
- Check the list of suppliers posted at the website <u>http://shellfish.ifas.ufl.edu/</u> <u>suppliers</u>

#### **TOP-ME Flat Tags**

74 Orion Street, Brunswick, Maine 04011, Phone: 207-449-1180, Email: info@topmetaas.com



These flat tags (approximately 1.0" by 3.75") have raised molded lettering with your choice of name, phone number, or AQ certificate identification (approximately 30 characters maximum). Theft warning text is molded on each tag and cannot be changed. Orange color, environmentally neutral dye, typically lasts over 10 years. Aluminum template is kept on file for 10 years. The tags can be attached to culture gear by cable ties or hog nose rings (not included).

#### NELCO Flag Markers

22 Riverside Drive, Pembroke, MA 02359, Phone: 800-346-3526, Website: <u>www.nelcoproducts.com</u>



These markers consist of flags available in two sizes: 5/8" by 1-1/8" and 1-1/8 by 1-7/8", which allow ample space for hot stamping your choice of name, phone number and AQ certificate identification in black lettering. The small flag can accommodate 3 lines of 13 characters each, while the mid-size flag can accommodate up to 23 characters for each line. The flags are attached to a nylon cable tie (6" in length), which is weather resistant, enduring additional ultraviolet light. The marker is used in continuous or extended exposure for outdoor use. These cable ties are rated for 120 lb tensile strength and have a double locking feature. Color choices are orange or yellow. No setup costs.

#### Aqua Bag Tags

Pelican Oyster Company, 2779 Red Maple Rd, Tallahassee, FL 32301 Phone: 843-291-9322, Email: <u>holler@pelicanayster.com</u>



These plastic tags are waterproof and UV protected, approximately 1"

by 2" in size with two mounting holes. The tag is attached to the culture gear with either hog rings or zip ties. The tag comes in white or orange colors with black ink. There is a maximum number of 5 lines allowed for customized printing with up to 25 characters including spaces per line. Use the third line where mounting holes are located for aquaculture certification number (AO#).

If you have any questions, please contact Leslie Sturmer (Phone: 352-543-5057, Email: <u>Inst@ufl.edu</u>) or Natalie Simon (Phone: 352-543-1088, Email: <u>Nsimon921@ufl.edu</u>). This list is provided as a service of the UF/IFAS Shellfish Aquaculture Extension Program. We do not sponsor or endorse any of these suppliers over any others.



## Clam Bag\* Stocking Info

Bag Mesh Size	Stock Rate* (#/bag)	Stock Volume (ml/bag)	Stock Density (number/ft <sup>2</sup> )
Nursery (3 mm)	10,000	500-650	625
Nursery (4 mm)	10-15,000	1000-1500	625-950
Growout (9 mm)	800-1200	400-1200	50-75
Growout (12 mm)	800-1200	800-2400	50-75

\* Assuming bag is 4' by 4' in dimensions or 16 square feet

# When to plant clams?



- Plan for year-round production
- Minimize mortalities by not planting seed in excessive heat of summer or cold of winter
- Determine seasonal rainfall
   events resulting in low salinities
- Evaluate seasonality of predators and abundance
- Determine seasonal closures
   o For example, red tide
- Assess risks associated with storms and excessive heat
- Document seasonal growth



### Clam Crop Survival

- Environmental conditions associated with clam mortalities
  - Low salinity events
  - High water temperatures (>95 °F)
  - Anaerobic conditions
- Susceptibility (tolerances) to these conditions related to
  - Size and age of animal
  - Physiological condition
  - Acclimation history
  - Other adverse conditions
- Other risks storms, hurricanes

# **Unexplainable losses**



#### Clam Crop Survival

- Biggest threat to clam production is predation
  - Crabs
  - Conchs and whelks
  - Rays
  - Drum. sheepshead
- Clam bag, cover netting, and net coating designed to minimize predation Evidence of predation – shells, bag Threats are dependent on clam size and seasons







### Clam Bag Covering Netting

- Need for additional predator protection
  - Losses associated with rays and drum
- Facilitates making belts
- Helps manage fouling or encourages fouling
- Adds to cost of culture equipment
- Site specific in terms of which material to use
- Variety of materials used
  - o Larger polyester mesh netting
  - Plastic "bird" netting
  - Chicken wire (1 or 2" hex mesh)

#### Clam Bag Net Dip

- Need for additional predator protection
  - Losses associated with cownose rays
- Stiffens the material
- May eliminate need for cover netting
- May encourage fouling
   Oyster spat
- Site specific in terms of which net dip to use





- Requires FDACS approval
- See FDACS Technical Bulletin #3: Net Coatings



## Clam Bag Net Dip



- Reviews pertinent regulations, food safety issues and approval process
  Provides recommendations on how to apply, handle, store and cure
- Products approved by FDACS

   Latex (water-based), alkyd
   Acrylic polymer

### Drift Algae Problems

- Drift algae or "rolling moss"
  - o Several types red, green
  - o Seasonal and site specific
  - Problematic on leases east coast and SW Florida
  - o Can form dense mats
  - Can result in clam suffocation and mortalities in summer
  - Control by harvesting / removing from lease area









### Fouling Problems

- Sea squirts (tunicates), Oysters
  - o Seasonal and site specific
  - o Can form dense mats
  - Can result in slower clam growth and possible mortalities in summer





- Control by going to 3-step growout, or removal/replacement of cover nets
  - Biocide-free, anti-fouling net coatings have limited application and are expensive

#### Other Clam Culture Considerations

- Bottom net culture
  - Developed for intertidal culture
  - Used primarily in Northeast U.S.
  - Consists of single layer of predator protection netting
  - Allows clams to bury deeper in substrate



#### Other Clam Culture Considerations

- Bottom net culture
  - In Florida may allow clams to bury deeper to escape heat stress
  - Deploying in deep waters may be difficult
  - Harvesting can be done by hand or by use of pump-driven devices
  - Mechanical harvesting not allowed on shellfish aquaculture leases



### Record Keeping

- Allows grower to manage information concerning nursery and growout farming operations
- Able to better keep track of inventory
- Map of lease site to keep track of clam plants
- Allows for monitoring of growth and survival
- Document crop losses



#### C.L.A.M. Software



Excel spreadsheets

#### USDA Farm Service Agency

- Noninsured Crop Disaster Assistance Program, or NAP
  - Administered by USDA Farm Service Agency (FSA)
  - Provides catastrophic coverage of clam crops
  - Basic coverage level is 50/55
  - Crop year: Oct 1- Sept 30
  - \$250 administrative fee
  - Can "buy-up" for additional premium costs
  - Sign-up by September 1
  - For complete listing of county offices in Florida, go to <u>www.fsa.usda.gov</u>
    - o Click on "State Offices" in top menu
    - o Click on Florida in the map
    - o In left-hand menu, click on "County Offices"



### Additional food for thought...

- Location, location, location...the most critical step.
- Start off small, allow time to move up the learning curve.
- You can learn as much by killing 100,000 seed as with a million.
- You don't make money growing shellfish, you make money selling 'em...if you get a good enough price.
- Approached in a logical, well-informed manner, clam farming has the potential for returning a profit on your efforts. But, done without adequate planning it is guaranteed to lose you money.
  It spite of available information, it will still be your time, money and dedication that will be required for a successful clam farm.